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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/653,750	09/03/2003	Gerald D. Zuraski JR.	5500-90500	3667

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EXAMINER

CHEN, ALAN S

ART UNIT PAPER NUMBER

2182

DATE MAILED: 03/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/653,750

Applicant(s)

ZURASKI ET AL.

Examiner

Alan S. Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 November 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-11 and 13-25 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1,3,5-11 and 14-25 is/are rejected.  
7) ☒ Claim(s) 4 and 13 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 12 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) <sup>1</sup> | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)           | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments files 11/4/2005 with respect to claims 4 and 13 have been fully considered and are persuasive. The rejections of claims 4 and 13 have been withdrawn.

2. Applicant's arguments with respect to claims <sup>1, 3, 5-11, and 14-25</sup> filed 11/4/2005 have been fully considered but they are not persuasive. Applicant argues several points, summarized below.

A) US Pat. No. 6,178,497 to Frederick et al. (Frederick) uses the word "vector" to refer to a scalar value, particularly for the term "age vector".

B) Frederick does not disclose when the age vector is generated.

C) Frederick and Roy do not teach each and every feature of the dependent claims.

3. Per argument A, Examiner does not agree with applicant's interpretation of vector. While it is true that Frederick age vector ( $A_i$ ) is only a binary/scalar value, this value clearly subsumes multiple other values that were required to generate it, which is clearly within an acceptable definition of a vector, a vector being a mathematical description of comprising at least two dimensions. More particularly, the age vector of Frederick is generated *at least* three other values (e.g., three dimensions), namely the Inhibit vector ( $I_i$ ), the Tail vector ( $T_i$ ) and the Valid vector ( $V_i$ ), each of which is a function dependent on other values (Table 2). Frederick's use of the word "vector" is consistent throughout his disclosure, each vector dependent on other vector values (Columns 4-6).

4. Per argument B, Examiner does not agree with applicant's interpretation of the Frederick, that the age vector is generated at the time of reading instead of writing. Frederick clearly suggests  $A_i$  is generated as soon as the buffer is written to. This suggestion is shown in several places. First, the current value of  $A_i$  is partly dependent on preceding values of the age vector, e.g.,  $i-1$  values. This is clearly known at the time that  $A_i$  is generated. Next, as shown in Column 5, lines 64,  $A_i$  is defined by  $A_i = (I_{i-1} \cdot T_i) \cdot V_i$ . Frederick clearly states that the Tail vector ( $T_i$ ) and Valid vector ( $V_i$ ) are generated in parallel (Column 5, lines 4-6, "In parallel with generation of the tail vector, the valid vector is generated). Frederick then expressly goes onto state that the function that generates the Valid vector is "...**performed in each entry** of the queue 201 to determine if an entry is valid or not **in response to the received input X**", emphasis added (Column 5, lines 7-11). Thus, all the values required to calculate  $A_i$  is known once the input X is written to a buffer entry.  $A_i$  is known as soon as the input is received in the buffer. To support that the age vector is actually generated as soon as the buffer is written to, Frederick expressly states that the logic circuitry in the age function block 202 (Fig. 2) generates the age vector. In Fig. 2, as soon as the tail vector and valid vector are known, e.g., at the writing of the buffer entry, it is inherent the logic circuitry calculates the output  $A_i$  once the inputs are known, since Frederick has no reason to delay calculation until a read, particularly since delay circuitry would entail further complexity in the logic circuitry of the age function block, element 202. Based on the equation stated above for the age vector, calculation of the age vector uses

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straightforward combinatorial logic, which computes the output immediately once the inputs are valid.

5. Per argument C, Examiner does not agree except for claims 4 and 13 as stated previously. Applicant makes explicit reference to claims 21-23, and argues that no reference is made in the figures of Frederick to any particular queue. However, as the previous Examiner pointed out in the first Office Action, column 2, lines 41+ expressly discloses the ability to employing a queue in various parts of a digital architecture, e.g., a processor, ASIC, etc., which is enough to read on the claim limitation. Applicant also uses generic language to express the type/function of queue, i.e., claiming a retire queue, load/store buffer, none of which positively limits the dependent claims since there is no definition in the claims as to the exact details of these type of queues. For instance, retire queue is easily construed to be any circular or shift type buffer where entries that are overwritten are in essence retired (old entries) and rejuvenated (new entries, while load/store buffers are by definition what buffers do, loaded/write to entries and temporarily storing those entries until read out.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 11 and 20-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Frederick.

8. Per claims 1, 11 and 20, Frederick teaches receiving data to be written to at least a first entry of a plurality of entries in a buffer (Fig. 2, queue 201 receives a plurality of entries; Column 2, lines 22-26 discloses having at least four entries); generating a first age vector of a plurality of age vectors responsive to receiving the data, each of the plurality of age vectors corresponding to one or more of the plurality of entries, the first age vector corresponding to at least the first entry (Fig. 2,  $A_i$ , the age vector is generated for each entry) and wherein the first age vector is indicative of which of the plurality of entries contain data that is older than the data being written to at least the first entry (an age function, to determine age vector,  $A_i$ , is generated to determine the age of entries relative to one another, column 4, line 39 through column 5, line 65); and selecting a selected entry of the plurality of entries for reading responsive to the plurality of age vectors (Fig. 2 and Column 4, lines 59-67, head pointer, as is well-known in the art, points to the youngest entry, while the tail pointer points to the oldest entry; the tail pointer is first read in first-in-first-out type buffers), the selected entry being the entry of the plurality of entries that: (i) has an attribute used to select the selected entry and (ii) other entries indicated as storing older data in the age vector corresponding to the selected entry do not have the attribute (valid vector,  $V_i$ , is any arbitrary function to which the age function is to use to determine if an entry is valid or not in response to the received input, column 5, lines 1-15).

9. As per claims 21-23, Frederick discloses claim 20, further disclosing a circular buffer queue implemented in a scheduler (Fig. 1, element 18 is sequencer by definition scheduling operations in the processor, utilizing circular buffer, e.g., element 38;

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Column 2, lines 40-55 discloses various other architectures in which the circular buffer can be applied), the operations to be executed by a core (Fig. 1, element 10 is a processor core); at least one circular buffer implemented in a retire queue (Fig. 2, element 201 is a circular queue which retires old entries upon overwriting them with new entries); at least one circular buffer implemented as a load/store buffer storing load/store operations (Fig. 1, element 28 shows load/store unit utilizing buffer, element 38).

10. Per claims 24 and 25, Frederick teaches claims 1 and 11, further disclosing storing a first vector (Fig. 2, elements  $A_i$ ) concurrent with writing data to the first entry (see Examiner's arguments per applicant's argument B), and using the first age vector in the selection of the selected entry ( $A_i$  is used to select the where the head and tail pointers shown in Fig. 2 should point).

### ***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 3, 5-10 and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable to Frederick in view of US Pat. No. 6,785,802 to Roy.

13. Per claims 3, 6-10 and 15-19, Frederick does not explicitly teach wherein the age vectors comprise a plurality of indications. Roy teaches a method of tracking instruction priority in an out of order instruction shelf of a microprocessor, including storing

respective instructions in a plurality of slots of an instruction pool, and storing, an instruction age tracker, a matrix of rows and columns of logic states associated with relative ages of instructions. The logic states in a given column and row are associated with a respective slots of the instruction pool. The method includes performing a logic function on each column of the matrix to determine the relative ages of the instructions stored in respective slots of the instruction pool (column 3, lines 29-42).

It would have been obvious to one of ordinary skill in the art to utilize the teachings of Roy as indications for the plurality of entries taught by Frederick and the corresponding age vectors for each entry. Doing so would provide a well-organized way of tracking what instructions have been processing in the out of order processing system of Frederick as some type of indication is necessary to point out what entries have a certain attribute.

14. As per claim 5 and 14, Frederick combined with Roy teach claims 1 and 11, respectively, wherein Frederick further teaches each of the plurality of entries having a different age vector. (Fig. 2, each queue entry has a corresponding age vector).

#### ***Allowable Subject Matter***

15. Claims 4 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is the statement of reasons for the indication of allowable subject matter: The prior art disclosed by the applicant and cited by the Examiner fail to teach or suggest, alone or in combination, **all** the limitations of the independent claim(s)

(claims 1 and 11), particularly where the plurality of entries in the buffer are additionally grouped into a plurality of non-overlapping groups, at least two entries included in each group, and wherein each of the plurality of age vectors corresponds to a different one of the plurality of groups, and wherein the age vectors corresponding to a first group of the plurality of groups indicates which of the other groups of the plurality of groups contain data that is older than the data in the first group.

### ***Conclusion***

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

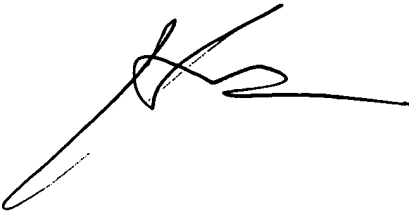
17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan S. Chen whose telephone number is 571-272-4143. The examiner can normally be reached on M-F 9am-5pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim N. Huynh can be reached on 571-272-4147. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ASC  
03/13/2006



**KIM HUYNH**  
**SUPERVISORY PATENT EXAMINER**  
3/19/06